Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems	)	ET Docket No. 98-153
	)	
	)	

To: The Commission

PETITION FOR RECONSIDERATION

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SUMMARY

Cingular Wireless LLC ("Cingular") hereby requests reconsideration of the *Memorandum Opinion and Order* ("*MO&O*") in the above-captioned proceeding. The *MO&O* should be reconsidered because it (i) permits the unlicensed operation of ultra-wideband ("UWB") devices pursuant to Part 15 of the Commission's rules in violation of Section 301 of the Act; (ii) was adopted without an adequate test record; (iii) ignores relevant evidence; and (iv) fails to adequately protect the rights of licensed providers of commercial mobile radio services ("CMRS"), such as Cellular Radiotelephone Service ("cellular") and the Personal Communications Service ("PCS").

Section 301 of the Communications Act prohibits wireless transmissions without first obtaining a license. Section 308, in turn, requires that an application be filed to obtain a license. The Commission's UWB decisions violate these statutory requirements by permitting UWB operations without a license.

Moreover, the Commission recognized that it must protect incumbent licensees from interference and that extensive test data and analyses would be required before it could conclude that UWB operations would pose no risk of harmful interference. Yet, after dismissing virtually all test data and analysis regarding the interference hazard posed by UWB devices to the CMRS industry – including E911 services – the Commission concluded that there was no risk of harmful interference. It also stressed the importance of input from its Technological Advisory Council ("TAC"), yet ultimately ignored the TAC recommendations that additional testing must be completed prior to authorizing UWB devices. This constitutes reversible error.

The *MO&O* also is flawed because it ignores relevant evidence supplied by Cingular and contains contradictory conclusions about the record. Specifically, Cingular proffered evidence regarding signal and interference levels in TDMA and GSM systems – both cellular and PCS. This evidence was ignored and the Commission refused to reconsider the impact of UWB on TDMA and GSM systems because Cingular supposedly failed to provide any evidence. This simply was not true. Worse, despite acknowledging that it never specifically considered UWB interference to TDMA and GSM systems, the Commission later claimed that additional testing was unnecessary because it had evaluated interference from *every possible scenario.*

Finally, the Commission recognized that it must protect the rights of incumbent licensees and stated that its decision was overprotective in this regard. The decision was far from overprotective with regard to the CMRS industry. The Commission actually reduced the protections afforded incumbent CMRS licensees. It severely undermined the exclusivity granted CMRS licensees; it precluded CMRS licensees from effectively policing interference caused by UWB devices; and it permitted, without a record basis, UWB devices to produce greater emissions indoors – areas where CMRS use is more susceptible to interference.

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Cingular Wireless LLC ("Cingular"), on behalf of its subsidiaries and affiliates, hereby requests reconsideration of the *Memorandum Opinion and Order* ("*MO&O*") in the above-captioned proceeding.[1] As discussed more fully below, the *MO&O* should be reconsidered because it (i) permits the unlicensed operation of ultra-wideband ("UWB") devices pursuant to Part 15 of the Commission's rules in violation of Sections 301 and 308 of the Act; (ii) was adopted without an adequate test record; (iii) ignores relevant evidence; and (iv) fails to adequately protect the rights of licensed providers of commercial mobile radio services ("CMRS"), such as Cellular Radiotelephone Service ("cellular") and the Personal Communications Service ("PCS").

BACKGROUND

The Commission commenced this proceeding in 1998 by proposing to amend Part 15 to permit UWB devices to operate on an *unlicensed* basis.[2] After reviewing the record, the Commission issued an *NPRM* two years later and noted that it must:

> ensure that existing and planned radio services, particularly safety services, are adequately protected [from interference]. UWB

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[1] *Revision of Part 15 of the Commission's Rules Regarding UWB,* ET Docket 98-153, *Memorandum Opinion and Order and Further NPRM,* 18 F.C.C.R. 3857 (2003).

[2] *Revision of Part 15 of the Commission's Rules Regarding UWB,* ET Docket No. 98-153, *Notice of Inquiry,* 13 F.C.C.R. 16376 (1998) ("*NOI*").

> technology is relatively new. Further testing and analysis is needed before the risks of interference are completely understood.[3]

The Commission also stated that testing was a prerequisite to "developing emission limits for UWB devices that will protect other radio services against interference."[4] The Commission recognized that UWB emissions were "considerably different" from those of existing Part 15 devices, in terms of "the peak to average ratio of emissions, the extremely narrow pulse widths, and the pulse repetition frequencies," and their emissions "could be near the maximum permitted levels over several gigahertz of spectrum."[5] Moreover, it acknowledged that the proliferation of UWB devices "could result in UWB devices causing a greater amount of harmful interference to other radio operations than [is caused by] digital devices."[6]

The Commission recognized the submission of papers from four UWB technology firms analyzing the cumulative impact on the RF noise floor. The Commission found these analyses inconclusive and stated that "further testing and analysis is desirable on this issue."[7] The Commission wanted "test data from various parties along with relevant input from the Commission's [Technological] Advisory Council" ("TAC").[8]

TAC Reports

From the outset, the TAC recognized that "experiments will be needed to validate theories and claims" regarding UWB.[9] The TAC suggested that experimental tests of UWB devices should be conducted on "a relatively large block of spectrum in some geographically

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3 *Notice of Proposed Rulemaking*, 15 F.C.C.R. 12086 (2000) ("*NPRM*").

4 *Id.* at 12099. The Commission also concluded that "the establishment of emissions limits requires a firm understanding of the characteristics of UWB signals, their impact on victim receivers, and the minimum separation distance between UWB devices and victim receivers." *Id.*

5 *Id.* at 12104.

6 *Id.*

7 *Id.* at 12107.

8 *Id.*

9 TAC, Second Meeting Report at 7 (Oct. 28, 1999).

remote location"[10] to obtain "defensible technical information."[11] The testing was deemed especially important given the "growing sense that there is already excessive interference and congestion in the Part 15 bands."[12] It characterized the specific UWB issue as follows:

> UWB deployment is primarily a problem of spectrum overlay and how existing services are to be accommodated in the presence of UWB signals . . . There have already been a number of filings on UWB, but the . . . problem is framed in different ways by different proponents. There needs to be a clear delineation of benefits achievable only with UWB, and the costs to others of its deployment. *It may be that the only way to move forward is by controlled experiments with real systems.*[13]

In addition to controlled UWB experiments, the TAC also noted that the FCC cannot engage in effective spectrum management until it "develop[s] a more complete understanding of the current state of the radio noise environment."[14] According to the TAC:

- There "could be a very serious emerging problem caused by the explosive growth of both intentional and unintentional radio sources. The future could be very different from what we might expect from past experience."[15]
- "[W]e could potentially be entering a period of rapid degradation of the noise environment. Such degradation would reduce our ability to meet the communications needs of the country. The principal negative impacts are likely to be reductions in the performance or reliability of wireless systems or increases in their costs."[16]
- "Data on the level and the changes of the noise environment is sorely lacking. . ."[17]
- "Weighing heavily on the decision to allow the approval of UWB . . . is a growing sense that there is already excessive interference and congestion in the Part 15 bands. Complaints have already come into the FCC from the general public."[18]
- "As we enter the new millennium, new noise sources are being developed (*e.g.*, ***ultrawideband devices***), and other electronic devices continue to proliferate . . . Many of these other individual sources of 'noise' may meet the current . . . rules, but in great numbers they may negatively affect the overall electromagnetic noise environment."[19]

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10 TAC, Second Meeting Report at 7.
11 *Id.* at 8.
12 TAC, Fifth Meeting Report at 1, 15 (June 28, 2002); Sixth Meeting Report at 2 (Sept. 27, 2002).
13 TAC, Third Meeting Report at 2 (Dec. 13, 1999).
14 TAC, Second Meeting Report at 1, 9.
15 TAC, Third Meeting Report at 1.
16 TAC, Fourth Meeting Report at 23 (Annex 4) (Mar. 24, 2000).
17 *Id.*
18 TAC, Fifth Meeting Report at 15.
19 TAC, Sixth Meeting Report at 25 (Annex 4: Abstract of Hagn Talk) (emphasis added).

- "Unlicensed radio seems to be an enormous success, but with the proliferation of more and more systems, we are in effect participating in an unplanned experiment in real time and are not sure how to predict the final outcome."[20]

The TAC urged the FCC to immediately undertake a multi-part study of the noise floor that would include a detailed analysis of available noise floor literature, the creation of detailed noise floor models and performance of simulations; and verification of the simulations.[21] This recommendation was accepted by the FCC.[22] The TAC also encouraged the FCC to refrain from permitting new unlicensed operations such as UWB until the noise floor study was complete.[23]

Comment Record

The Commission received numerous comments from virtually all sectors of the telecommunications industry opposing the blanket authorization of UWB devices under Part 15.[24] Commenters also urged the Commission to study the noise floor and complete comprehensive UWB testing prior to authorizing the devices pursuant to Part 15.[25] Cingular specifically noted that UWB operations should not be permitted without extensive testing and a comprehensive analysis of the cumulative effect of UWB devices on the noise floor.[26] Sprint "urge[d] the Commission to ensure that comprehensive testing is performed beyond that proposed by the NTIA and DOT, *covering the full range of UWB applications and all services currently operating within bandwidths potentially impacted by UWB interference before seeking*

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[20] TAC II, First Meeting Report, at 9 (Aug. 26, 2001) (Council II, First Report) (emphasis added).

[21] TAC, Third Meeting Report at 8-9.

[22] *See* Fourth Meeting Report at 7; Fifth Meeting Report at 14.

[23] Fourth Meeting Report at 9-10.

[24] *See* AARL Comments at 5 (Apr. 25, 2001); Aeronautical Radio, Inc. Comments at 3-4 (Apr. 25, 2001); Boeing Corporation Supplemental Comments at 1-2 (Apr. 23, 2001); Conexant Systems Inc. Comments at 2 (Apr. 25, 2001); Lockheed Martin Corporation Comments at 5 (Apr. 25, 2001); Motorola, Inc. Comments at 1-10 (Apr. 25, 2001); Nokia Inc. Comments at 1-2 (Apr. 25, 2001); Sirius Satellite Radio Inc. Comments at i, 15-16 (Apr. 25, 2001); Sprint Corporation Comments at 5-7 (Apr. 25, 2001); U.S. GPS Industry Council ("USGPSIC") Comments at 1-2, 9-10 (Apr. 25, 2001).

[25] *See, e.g.*, Nortel Networks Comments at 2 (Sept. 12, 2000); Sprint PCS Comments at 1 (Sept. 12, 2000); Alloy LLC Reply Comments at 1-4 (Oct. 27, 2000) (Alloy was the original name for Cingular).

[26] Alloy Reply Comments at 1-4 (Oct. 27, 2000).

recommendations regarding operational restrictions of UWB and, certainly, before promulgating permanent rules in this regard."[27]

Tests and mathematical analyses demonstrating the likelihood that UWB operations would cause interference to PCS operations were submitted by Motorola, Qualcomm, and Sprint.[28] Cingular submitted information regarding the signal and interference levels in cellular, TDMA PCS, and GSM PCS systems and demonstrated that these systems were likely to receive interference from UWB operations.[29] The only contrary test analysis was submitted by Time Domain Corporation ("TDC") and was limited to an analysis of potential interference between CDMA PCS and UWB devices.[30]

In general, the PCS tests established that the proposed amendments to Part 15 to permit UWB deployment would cause harmful interference to licensed CMRS operations.[31] In particular, this information demonstrated that:

- a PCS handset would receive harmful interference from any device that causes a 1 dB rise in the receiver thermal noise floor;[32] and
- UWB emissions at 12 dB below the Part 15 limits (*i.e.*, the level the Commission proposed and ultimately adopted) would cause interference to CMRS systems.[33]

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[27] Sprint PCS Comments at 2 (Sept. 12, 2000).

[28] *See First Report*, 17 F.C.C.R. 7435, 7488-91 (2002).

[29] Letter from Jim Bugel, Executive Director, Regulatory Affairs, Cingular Wireless LLC, to Julius Knapp, Deputy Chief, FCC Office of Engineering and Technology at 1-2 (Oct. 12, 2001) ("Bugel Letter"). Cingular also provided information regarding its SMR operations. *Id.* at 2-3.

[30] *See First Report*, 17 F.C.C.R. at 7488-91. XtremeSpectrum, Inc. ("XSI") submitted comments opposing the tests and analyses demonstrating the likelihood of interference between CDMA PCS and UWB devices. *Id.* XSI did not conduct its own tests however.

[31] Motorola Comments (Sept. 12, 2000); Dr. Jay Padgett, Senior Research Scientist, Telcordia Technologies, "A Model for Calculating the Effect of UWB Interference on a CDMA PCS System" ("UWB Interference Model") and "Summary of Testing Performed by Sprint PCS and Time Domain to Characterize the Effect of Ultra Wideband (UWB) Devices on an IS-95 PCS System" ("Telcordia Test Summary"), *appended as* Attachments 1 and 2 to letters filed September 12, 2000, by Sprint and TDC; Qualcomm Report (Mar. 5, 2001); Cingular Wireless LLC, Qualcomm, and Verizon Wireless Ex Parte at 1-2 (May 24, 2002); Sprint PCS Ex Parte at 1, 4-6 (Jan. 30, 2002); Qualcomm Report (Jan. 12, 2002).

[32] Motorola Comments at 10 (Sept. 12, 2000); Qualcomm Report at 7 (Mar. 5, 2001); *accord First Report*, 17 F.C.C.R. at 7488, 7491.

[33] *First Report*, 17 F.C.C.R. at 7489; Bugel Letter at 2.

Based on its analysis, Motorola demonstrated that the maximum UWB emission level should be at least 16-24 dB, and as much as 27-35 dB, below current Part 15 levels.[34]

The most extensive test analysis involving PCS was submitted by Sprint and TDC, jointly relying on testing conducted by Telcordia. They submitted both a theoretical model[35] and operational tests,[36] including anechoic chamber tests and open-field real-world tests. The report on the real-world component of this showing notes that tests were performed at high, moderate, and low received CDMA signal levels, but that only the moderate received signal level test provided enough information for analysis. In the moderate level test, the total power level received by the handset was -92 to -96 dBm. Because that includes overhead channels as well as traffic channels, "the received traffic channel power was in the range of -106 to -115 dBm most of the time" and "the received [traffic channel] signal could be as low as about 13 dB below the [-105 dBm] noise floor, or about -118 dBm."[37] In the test, when a UWB device was brought within one foot of the CDMA handset receiving a traffic channel at -99 to -103 dBm — considerably stronger than the typical moderate-level signal — the base station power increased to overcome interference and the call was dropped. Because the test was conducted on an unloaded system, the report noted that a call as strong as -85 to -89 dBm would be dropped on a loaded system.[38]

Sprint's supplemental comments addressing this test showed that the cell capacity loss that would be caused by the power increase due to UWB devices would be at least as significant

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34 Motorola Ex Parte at 3 (Feb. 1, 2002).

35 *See* UWB Interference Model, appended to letters filed Sept. 12, 2000, by Sprint PCS and TDC.

36 *See* Telcordia Test Summary, appended to letters filed Sept. 12, 2000, by Sprint PCS and TDC.

37 *Id.* at 4. (The -105 dBm thermal noise floor is based on CDMA's 1.25 MHz bandwidth and a noise figure of 8 dB for the mobile receiver.)

38 *Id.*

in terms of interference as the direct interference (call drop) to the CDMA unit.[39] Sprint also made clear that at the signal levels proposed (and adopted) by the FCC, a UWB device could cause blocked calls to handsets within three meters at a rate of 1.2 to 4.8%, and to handsets within two meters at a rate of 2.0 to 7.9%.[40] Sprint also demonstrated that a single UWB device would raise the noise floor by nearly 4 dB at a distance of two meters from a PCS handset and by 1.3 dB at four meters.[41]

Commenters further noted that UWB devices would interfere with the provision of enhanced 911 ("E911") services.[42] Qualcomm submitted test data and analysis regarding the impact of UWB emissions on E911 service provided via handsets equipped with assisted GPS ("A-GPS"), a technology utilizing both GPS and terrestrial signals to ascertain the location of callers in areas where GPS technology alone would be insufficient.[43] USGPSIC also submitted a detailed analysis of the likelihood of interference between A-GPS handsets and UWB devices.[44]

No other tests of the relationship between UWB devices and CMRS systems or E911 technologies were submitted. UWB advocates submitted no additional test data and did not address potential interference to cellular, TDMA PCS, or GSM PCS. The comments of TDC and XSI were limited to the CDMA PCS interference issue.[45] No party addressed or refuted the signal strength and interference level data provided by Cingular.[46]

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39 Sprint Supplemental Comments at 4-5 (Oct. 2, 2000).

40 *Id.* at 5.

41 *Id.* at 5-6.

42 Cingular Wireless LLC Reply Comments at 3-4 (May 10, 2001); Sprint PCS *Ex Parte* at 8 (Jan. 30, 2002); Qualcomm Ex Parte at 15 (Jan. 11, 2002); Stephen D. Baruch, Counsel for the USGPS, Written Ex Parte Presentation at 11 (June 21, 2001); Qualcomm, Oral Ex Parte Presentation (Sept. 26, 2001); Qualcomm Written Ex Parte Presentation (Jan. 11, 2000).

43 Qualcomm Written Ex Parte Presentation (Jan. 11, 2000).

44 Stephen D. Baruch, Counsel for the USGPS, Written Ex Parte Presentation at 11 (June 21, 2001).

45 TDC Comments at 79 (Apr. 25, 2001); XSI Comments at 4-8 (May 10, 2001).

46 Bugel Letter at 2-4.

First Report and Order

On April 2, 2002, the Commission issued its *First Report and Order* and stated that it was taking an "extremely conservative" approach to "ensure that UWB devices coexist with authorized radio services without the risk of harmful interference while we gain experience with this new technology."[47] Despite the calls for extensive testing prior to authorizing UWB devices, however, the order authorized the unlicensed operation of UWB devices without such tests. Moreover, the Commission ignored or dismissed as unrealistic all of the analyses supplied by the CMRS industry – Cingular, Motorola, Qualcomm, and Sprint.[48] Because it dismissed the field tests relied upon by Sprint, the Commission failed to base its decision on real world tests.

Despite dismissing the only real world test data, the Commission stated that "we do not believe that UWB devices will present a significant risk of harmful interference to PCS, *particularly when evaluated under actual operating conditions instead of in a laboratory environment.*"[49] The Commission then concluded that PCS would be adequately protected by a 12 dB reduction in UWB emissions because that was the reduction adopted for the *GPS band*.[50]

With respect to A-GPS, the Commission dismissed the tests conducted by Qualcomm[51] and refused to accept the analysis proffered by the USGPSIC. The Commission indicated that the USGPSIC analysis was flawed because it evaluated the impact of multiple UWB devices in close proximity of an A-GPS receiver.[52] No explanation was provided for the Commission's conclusion that multiple UWB devices could not be in close proximity to an A-GPS receiver.

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47 *First Report*, 17 F.C.C.R. at 7437.
48 *Id.* at 7489-91.
49 *Id.* at 7491.
50 *Id.* No explanation was provided as to why the two bands should have the same UWB emission limits.
51 *Id.* at 7475 (dismissing the tests as "inconclusive").
52 *Id.* at 7474.

Nevertheless, the Commission modified the USGPSIC analysis to consider only interference from a single UWB device and based its decision on this analysis.[53]

Reconsideration

Cingular, Sprint, and Qualcomm sought reconsideration of this decision,[54] and AT&T Wireless Service, Inc. ("AWS") and the USGPSIC submitted supporting comments.[55] These parties claimed that the Commission erred by authorizing UWB without first testing and analyzing the impact these devices would have on CMRS service and E-911 operations.[56] Qualcomm asserted that the Commission should have established standards for UWB emissions in the PCS bands based on test data. Sprint, Cingular, Qualcomm and AWS also stated that the Commission should have conducted tests using "real UWB devices."[57]

The Commission denied these requests because:

> We find no need to require the submission of additional test data in this proceeding before UWB systems can begin operation. *There have been considerable analyses throughout this proceeding on every possible aspect of interference under the worst receive conditions imaginable.* Tests already have been performed, not using actual UWB devices since compliant UWB devices were not yet available but using generated signals that range from a noise-type emission to modulation types that have the highest probability of causing interference. We see no need to further delay this proceeding by providing additional testing.[58]

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53 *First Report*, 17 F.C.C.R. at 7474.

54 Cingular Petition at 1-25; Sprint Corporation Petition for Reconsideration (June 17, 2002); Qualcomm Petition for Reconsideration (June 17, 2002).

55 AWS Comments (July 31, 2002); USGPSIC, Consolidated Opposition to, and Comments in Support of, Petitions for Reconsideration (July 31, 2002).

56 *See MO&O*, 18 F.C.C.R. at 3878-79. The USGPSIC supported this position. *Id.* at 3882.

57 *Id.* at 3897; *see* Cingular Petition at 20-21; Sprint Petition at 36-39; Qualcomm Petition at 5-6; AWS Comments at 19.

58 *MO&O*, 18 F.C.C.R. at 3897.

Cingular timely filed this Petition for Reconsideration pursuant to Section 405 of the Communications Act and Section 1.106 of the Commission's rules.[59]

DISCUSSION

I. THE AUTHORIZATION OF UWB DEVICES ON AN UNLICENSED BASIS VIOLATED SECTION 301 OF THE ACT

One of the central reasons for the Commission's creation was to end the chaos of interference that resulted from a free-for-all of spectrum usage.[60] The foundational step in creating order is contained in Section 301 of the Communications Act of 1934, as amended ("the Act"), which states:

> No person shall use or operate *any apparatus* for the transmission of energy or communications or signals by radio . . . except in accordance with this Act *and with a license* in that behalf granted under the provisions of the Act.[61]

By enacting Section 301, Congress prohibited wireless transmissions without a license.[62] This limited the number of occupants of the spectrum, which reduced the potential for interference.

Congress established detailed procedures for obtaining licenses.[63] The threshold requirement is contained in Section 308(a) and requires the submission of an application as a prerequisite to obtaining a license.[64]

The rules for unlicensed devices originated in 1938.[65] According to the Commission, the rules were:

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59 *See* 47 U.S.C. § 405; 47 C.F.R. § 1.106.

60 *See* Cingular, Petition for Reconsideration at 1-2 (June 17, 2000) ("Cingular Petition"); s*ee also Red Lion Broad. v. FCC*, 395 U.S. 367, 375-77 (1969); FCC Office of Network Study, Second Interim Report on Television Network Procurement, 65-66 (1965); *National Broadcasting Co. v. U.S.*, 319 U.S. 190, 212 (1943) ("*NBC*") ("With everybody on the air, nobody could be heard.").

61 47 U.S.C. § 301 (emphasis added).

62 Section 307(e) sets forth the only exceptions to this requirement. 47 U.S.C. § 307(e) (exempting the citizens band radio service, radio control service, aviation radio service, and maritime radio service from the license requirement).

63 *See, e.g.*, 47 U.S.C. §§ 305-309.

64 47 U.S.C. §308(a).

> based upon the rationale that if radiation can be kept within certain fixed limitations, a general assumption can be made that such operations will normally not cause interference *to interstate communications or otherwise have interstate effects* bringing such operations within the purview of those which must be licensed under Section 301 of the Communications Act.[66]

Congress always intended Section 301 to cover intrastate, as well as interstate, transmissions and eliminated any uncertainty on this issue – and thus eliminated the purported statutory basis for Part 15 – in 1982 when it amended Section 301 "to make clear that the Commission's jurisdiction over radio communications extends to intrastate as well as interstate transmissions."[67] The amended statute expressly requires a license for transmissions "from one place in any State . . . to another place in the same State. . ."[68] Congress stated that the amendment would also make Section 301 consistent with prior judicial decisions finding that all radio signals are inherently interstate.[69] Thus, Section 301 unquestionably requires a license for all low-power transmissions. Accordingly, the Commission cannot authorize UWB operations on an unlicensed basis.

The fatal flaw associated with permitting unlicensed operations pursuant to Part 15 has already been raised by the American Radio Relay League ("ARRL").[70] This petition has been pending for more than one year. It would be arbitrary and capricious for the Commission to permit unlicensed UWB operations without addressing the statutory basis for such operations.

(continued)

65 *See Revision of Part 15 of the Rules Regarding the Operation of RF Devices without an Individual License*, GEN. Docket No. 87-389, *First Report and Order*, 4 F.C.C.R. 3493 (1989).

66 *Amendment of Part 15 of the Commission's Rules Governing Restricted Radiation Devices*, Docket No. 9288, *First Report and Order*, 13 RR (P&F) 1543, 1544 (1955) (emphasis added).

67 Communications Amendments Act of 1982, P.L. 97-259; H.R. Conf. Rep. No. 97-765 at 31-32 (1982), *reprinted in* 1982 U.S.C.C.A.N. 2261, 2275-76.

68 47 U.S.C. §301(a).

69 1982 U.S.C.C.A.N. at 2276 (citing *Fisher's Blend Station*, 297 U.S. 650, 655 (1936)).

70 ARRL Petition for Reconsideration, ET Docket No. 98-156 (Feb. 13, 2002).

The Section 301 licensing requirement must be scrupulously applied in this setting. UWB applications will not be limited to sporadic use of ground penetrating radars and wall-imaging systems by public safety personnel. UWB devices will be utilized by the general public thereby increasing the likelihood for pervasive use of such devices.[71] As Boeing stated, the "potential impact of ubiquitously deployed UWB systems – especially when considered in the aggregate and when operated in an unsupervised fashion – is too significant to permit authorization under a Part 15 regulatory regime that fails to provide the Commission with sufficient means to control the number and operation of UWB devices."[72] The Commission should not turn a blind eye to such interference because: (i) UWB operators will not know when they are interfering, and therefore will not curtail their operations in accordance with Part 15; and (iii) licensed operators will not be able to identify interfering parties.

Licensing, not unlicensed use, is the statutory model. Congress made clear that spectrum use should be permitted *only* with a license, except in the four specifically delineated services in Section 307(e). UWB does not fit within any of these services. The Commission's authority to permit unlicensed UWB operations is therefore non-existent. Once these devices proliferate, there will be no way to cure the interference they cause. This was a problem Section 301 was intended to prevent. If UWB devices were licensed, then incumbent licensees could track the interference and require the offending UWB licensees to cease operations.

II. IT WAS ARBITRARY AND CAPRICIOUS TO AUTHORIZE UWB DEPLOYMENT UNDER PART 15 WITHOUT AN ADEQUATE RECORD

Under the Administrative Procedure Act, courts must "'hold unlawful and set aside agency action' that is 'arbitrary, capricious, an abuse of discretion, or otherwise not in accord-

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71 *See First Report*, 17 F.C.C.R. at 7441-42 (discussing wide variety of possible uses).

72 Boeing Co., Supplemental Comments at 5 (April 23, 2001).

dance with law.'"[73] To avoid invalidation pursuant to this standard, agency decisions must be:

> based on a consideration of the relevant factors, . . . and rest on reasoned decisionmaking in which 'the agency must examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made.'[74]

The UWB decisions violate these principles and constitute unreasoned decisionmaking. The Commission recognized that any changes to Part 15 must continue to insulate FCC licensees from harmful interference and that, given the importance of this non-interference condition, it "should be cautious until [it has] gained further experience with this technology."[75] Yet, the Commission rejected every conservative measure proposed by the CMRS industry to protect their operations from harmful interference and to ensure that UWB devices do not interfere with E911 calls. Moreover, despite indicating that testing and input from the TAC would be critical to any UWB decision,[76] the Commission moved forward without an adequate test record and without heeding the recommendations of its TAC.

A. The FCC Ignored Its Determination, Supported By The TAC, That UWB Could Be Authorized Only Based On An Extensive Test Record

The Commission recognized that the proliferation of UWB devices "could result in UWB devices causing a greater amount of harmful interference to other radio operations than digital devices."[77] Thus, it concluded that before UWB devices could be authorized, test data would be required to "develop[]emission limits for UWB devices that will protect other radio services

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73 *BellSouth Corp. v. FCC*, 162 F.3d 1215, 1221 (D.C. Cir. 1999) (quoting 5 U.S.C. § 706(2)(A)).

74 *United States Telecom Association v. FCC*, 227 F.3d 450, 461 (D.C. Cir. 2000) (citing *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416 (1971); *Motor Vehicle Manufacturers Association v. State Farm Mutual Automobile Insurance Co.*, 463 U.S. 29, 43 (1983)); *see also Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962).

75 *First Report*, 17 F.C.C.R. at 7444.

76 *NPRM*, 15 F.C.C.R. at 12107.

77 *Id.* at 12104.

against interference."[78] The Commission understood that UWB emissions were "considerably different" from those of existing Part 15 devices[79] and, therefore, "the establishment of emissions limits requires a firm understanding of the characteristics of UWB signals, their impact on victim receivers, and the minimum separation distance between UWB devices and victim receivers."[80] The Commission stated that it wanted "test data from various parties along with relevant input from the Commission's [TAC]."[81] The Commission ignored all of these findings without explanation.[82]

The TAC concluded that "experiments will be needed to validate theories and claims" regarding UWB[83] and urged the Commission to conduct experimental tests of UWB devices on "a relatively large block of spectrum in some geographically remote location"[84] in order to obtain "defensible technical information."[85] These findings were ignored. The Commission never conducted the recommended tests and, therefore, was never able to base its UWB decision on "defensible technical information."[86] The *First Report* and *MO&O* contain virtually no test data to validate the Commission's theories with respect to CMRS. This constitutes unreasoned decisionmaking.[87]

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78 *NPRM*, 15 F.C.C.R. at 12099.
79 *Id.* at 12104.
80 *Id.* at 12099.
81 *Id.*
82 *See* discussion *supra* at pages 2-4.
83 TAC, Second Meeting Report at 7.
84 *Id.* at 8.
85 *Id.* at 7.
86 *See id.*
87 *See State Farm*, 463 U.S. at 43 (no factual basis for determination); *Greater Boston Television Corp. v. FCC*, 444 F.2d 841, 852 (1970) (agency must acknowledge a change in course, and supply a reasoned basis for doing so).

B. The Record Does Not Justify the FCC's Conclusions Regarding UWB Interference to Cellular, PCS, and Assisted GPS

As discussed above, the *First Report* authorized UWB operations without an extensive test record. Cingular and others urged the Commission to reconsider this decision and maintained that additional testing was necessary[88] to ensure that the Commission's "conservative" approach would protect incumbents from "the risk of harmful interference."[89] The Commission rejected these claims and determined that there was no need to delay the authorization of UWB devices until the completion of detailed testing because:

> There have been considerable analyses throughout this proceeding on every possible aspect of interference under the worst receive conditions imaginable. Tests already have been performed, not using real UWB devices since compliant UWB devices were not yet available but using generated signals that range from a noise-type emission to modulation types that have the highest probability of causing interference. . . . An interference test based on actual UWB production units will not encounter all of these worst case conditions at the same time.[90]

This simply is not accurate. With regard to the CMRS industry, the only tests and mathematical analyses were submitted by Motorola, Qualcomm, Sprint and TDC. No test data was supplied for cellular or non-CDMA PCS. Cingular submitted evidence, however, setting forth the signal and interference levels associated with TDMA cellular, TDMA PCS, and GSM PCS systems. As discussed below, the Commission either dismissed or ignored virtually all this data. Therefore, the Commission's decision lacks any rational connection between the facts and the choice made.[91]

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88 Cingular Petition at 10-14; Sprint Petition at 36-39; Qualcomm Petition at 5-6.

89 *See First Report*, 17 F.C.C.R. at 7436, 7437.

90 *MO&O*, 18 F.C.C.R. at 3897.

91 *See USTA*, 227 F.3d at 461 (citing *Overton Park*, 401 U.S. at 416; *State Farm.*, 463 U.S. at 43); *see also Burlington Truck Lines*, 371 U.S. at 168.

1. Cellular

In response to questions posed by the FCC's Office of Engineering and Technology staff, Cingular submitted information regarding signal and interference levels in its TDMA cellular networks.[92] Specifically, Cingular demonstrated that the typical receiver sensitivity in many urban environments was -103 dBm for its TDMA cellular networks.[93] Based on these operational characteristics, Cingular demonstrated that a UWB device operating 12 dB below the current Part 15 limit would cause interference and raise the noise floor for mobiles within 10 meters. No other information regarding cellular networks is contained in the record.

The cellular data supplied by Cingular was completely disregarded by the Commission. In its initial order, the Commission failed to discuss the impact of UWB devices on cellular systems. Cingular urged the Commission to reconsider its decision given the lack of analysis of UWB's impact on cellular systems, but the Commission rejected the request because Cingular failed to provide "information on other types of modulations that could be employed for cellular or for PCS."[94] The Commission went on to note that reconsideration was not warranted because "no new technical details regarding the operation of cellular systems" were provided and no party "refut[ed] the Commission's discussion in the R&O regarding the acceptable level of UWB emissions in the cellular radio spectrum."[95] This decision constitutes reversible error.

Technical details regarding cellular systems were provided by Cingular, but the Commission never addressed the information.[96] Moreover, there was no discussion in the *First Report* regarding UWB interference to cellular systems. In fact, the term "cellular" does not

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92 Bugel Letter at 1-2.
93 *Id.* at 2.
94 *MO&O*, 18 F.C.C.R. at 3893.
95 *Id.* at 3894.
96 Bugel Letter at 2-4.

appear in the *First Report*. The FCC articulated no basis for allowing UWB signals in the cellular band up to the existing Part 15 limits.

2. PCS

Tests and analysis of the potential impact of UWB on PCS were submitted by four parties: Motorola, Qualcomm, Sprint and TDC.[97] Motorola submitted a mathematical analysis, Qualcomm submitted both a mathematical analysis and the results of laboratory testing using a CDMA PCS simulator, and Sprint and TDC submitted both theoretical analysis and limited test data. In addition, Cingular supplied data regarding signal and interference levels for TDMA and GSM PCS networks.[98] The Commission rejected or ignored virtually all of this evidence.

Motorola's mathematical analysis demonstrated that PCS receivers require protection from emissions to a level 6 dB below the thermal threshold.[99] This would require that the maximum UWB emissions be set at a level at least 16-24 dB, and as much as 27-35 dB, below current Part 15 levels.[100] The Commission specifically rejected this analysis, however, because: "we do not believe that Motorola's calculations provide a reasonable representation of the interference potential of UWB to PCS operations."[101]

Qualcomm (which is the principal technology expert on CDMA) submitted an analysis demonstrating that CDMA PCS systems operate at the -105 dBm thermal noise floor. Sprint submitted data supporting this position.[102] Cingular submitted data indicating that calls are routinely delivered in urban areas to handsets with -103 dBm signal sensitivity in TDMA

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97 *First Report*, 17 F.C.C.R. at 7488-91.
98 Bugel Letter at 1-2.
99 *First Report*, 17 F.C.C.R. at 7488-89.
100 Motorola Ex Parte at 3 (Feb. 1, 2002).
101 *First Report*, 17 F.C.C.R. at 7489.
102 *See id.* at 7489-90.

markets and -102 dBm in GSM PCS markets.[103] No hard data was supplied to rebut any of the operating levels. Yet, the Commission either rejected or ignored all of this analysis in favor of the more liberal analysis supplied by UWB proponents TDC and XSI. This approach is inconsistent with the Commission's conclusion that it must be "extremely conservative" and "overprotective" until further data is collected regarding UWB devices.[104]

In the *MO&O*, the Commission again focused on CDMA PCS systems.[105] In response to Cingular's claim that further analysis was necessary for TDMA and GSM PCS systems, the Commission stated:

> While Cingular objects to our not providing similar [non-CMDA] analyses for TDMA and GSM modulation types, we based our analysis on the specifications provided by the proponents. We note that *Cingular has not provided any additional information on other types of modulations that could be employed for cellular or PCS.*[106]

This statement acknowledges that the Commission failed to consider the record evidence supplied by Cingular in the Bugel Letter with respect to signal and interference levels in TDMA and GSM PCS systems. Thus, the only analysis contained in the record regarding UWB-PCS interference that the Commission considered relates to CDMA PCS systems. Its decisions ignored directly relevant evidence regarding other technologies and are subject to reversal.

Although the Commission claims that it considered every possible interference scenario prior to concluding that UWB operations posed no risk of harmful interference to PCS

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103 Bugel Letter at 2-4.

104 *See First Report*, 17 F.C.C.R. at 7436-37. Moreover, the Commission never addresses how its analysis – based on TDC's view of a CDMA PCS system – could constrain the deployment of new technologies by CMRS licensees. The emissions produced by UWB emissions could preclude the deployment of certain technologies due to interference concerns.

105 *MO&O*, 18 F.C.C.R. at 3886-94.

106 *Id.* at 3893 (emphasis added).

systems,[107] the evidence proves otherwise. The Commission was engaged in result-oriented decisionmaking and relied only upon material and arguments proffered by UWB proponents. Instead of taking the conservative approach it claimed to follow, the Commission took a liberal, if not cavalier, approach designed to ensure the deployment UWB. Hard evidence contrary to this result was discounted or ignored because it conflicted with the desired outcome. Such an approach is not consistent with the Commission's stated intention to be "overprotective" of the CMRS industry, nor does it ensure CMRS licensees are protected from harmful interference.[108]

UWB devices should not have been authorized until additional testing was completed. As the TAC noted:

> There have already been a number of filings on UWB, but the available information needs to be organized as the problem is framed in different ways by different proponents. There needs to be a clear delineation of benefits achievable only with UWB, and the costs to others of its deployment. *It may be that the only way to move forward is by controlled experiments with real systems.*[109]

The Commission should heed TAC's advice and, consistent with its stated intentions, take the conservative approach on reconsideration and preclude UWB deployment until real-world tests validate that UWB devices do not pose a risk of harmful interference to CMRS. Reliance on the single test analysis provided by TDC and comments of XSI is not sufficient to overcome the substantial evidence provided by the CMRS industry.[110]

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107 *MO&O*, 18 F.C.C.R. at 3897.

108 *See id.* at 3858, 3859-60. The Commission dismisses harmful interference concerns raised by the CMRS because processing gain can be used to solve the problem. *See MO&O* at ¶¶81082. As processing gain is increased to overcome interference, however, the capacity of the CMRS system decreases and inefficient spectrum use is created.

109 TAC, Third Meeting Report at 2.

110 *See Cellular Tel. Co. v. Town of Oyster Bay*, 166 F3d 490, 494 (2d Cir. 1999) (stating that an agency's factual findings must be supported by substantial evidence which "has been construed to mean less than a preponderance, but more than a scintilla"); *Universal Camera Corp. v. NLRB*, 340 U.S. 474, 477 (1951) (decision must be supported by "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion").

3. Phase II E911 Service

In response to the NPRM, commenters noted that UWB devices would interfere with the provision of E911 services and therefore urged the Commission to adopt more stringent emission limitations for UWB devices or preclude their operation below 2 GHz.[111] They stressed the importance of additional testing because once UWB devices proliferate, there will be no way to remedy interference to E911 service. The only test that analyzed the potential for interference to E911 technologies from UWB devices was conducted by Qualcomm.[112] The USGPSIC submitted a methodology designed specifically to calculate interference between A-GPS and UWB devices.[113] All of this evidence demonstrated that UWB devices were likely to interfere with E911 services.

In the *First Report*, the Commission again dismissed evidence that demonstrated the interference potential of the UWB devices – this time with regard to E911 services.[114] Instead, the Commission based its decision on theoretical formulas designed to account for possible interference to A-GPS devices used to supply E911 information, rather than on actual test data.[115]

Cingular and others sought reconsideration on the ground that the proliferation of UWB devices could jeopardize E911 service.[116] Cingular showed that UWB devices posed a threat of harmful interference to two different E911 technologies. First, UWB devices may interfere with the provision of E911 information via A-GPS in two ways, either by: (1) producing sufficient

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111 Cingular Wireless LLC Reply Comments at 3-4 (May 10, 2001); Sprint PCS *Ex Parte* at 8 (Jan. 30, 2002); Qualcomm Ex Parte at 15 (Jan. 11, 2002).

112 *First Report*, 17 F.C.C.R. at 7462. CMRS carriers generally utilize two types of technologies for providing E911 services: A-GPS or a technology that determines location based on signal strengths received either by base stations or handsets. Qualcomm tested potential interference to an A-GPS handset.

113 *Id.* at 7472.

114 *Id.* at 7472-76.

115 *Id.*

116 Cingular Petition at 20-21; Sprint Petition at 24-26; Qualcomm Petition at 12-13.

interference to prevent the placement of an E911 call altogether (*e.g.*, a call placed from indoors), or (2) producing lower interference levels that would permit the placement of an E911 call but reduce or eliminate the accuracy associated with A-GPS. Second, UWB devices could completely undermine E911 technologies that rely on CMRS signal strengths to locate callers. If interference from a UWB device alters the signal strength received by a base station or handset, the algorithms used to determine the location of an E911 caller may not work properly. At a minimum, Cingular noted that the deployment of UWB devices may preclude the completion of E911 calls in marginal service areas.

In the *MO&O*, the Commission found these arguments unpersuasive because they merely demonstrated the possibility that interference may be caused to E911 calls placed in fringe coverage areas.[117] Such a conclusion is at odds, however, with the public interest determinations made by the Commission in the E911 docket. There the Commission adopted extensive procedures to ensure that E911 calls could be placed from fringe areas.[118]

The Commission's analysis also was focused on potential interference between UWB devices and E911 service provided via A-GPS.[119] This analysis disregarded actual tests using A-GPS handsets in favor of data based on tests without such handsets.[120] Moreover, the Commission never analyzed the potential for interference to E911 systems raised by Cingular – interference to network-based E911 systems that use signal strength to produce location information.[121] This result-oriented approach to UWB jeopardizes public safety.

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117 *See MO&O*, 18 F.C.C.R. at 3894.

118 *See, e.g., Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, *Second Report and Order*, 14 F.C.C.R. 10954 (1999).

119 *See MO&O*, 18 F.C.C.R. at 3895.

120 *Id.* The NTIA tests cited by the Commission never utilized A-GPS handsets.

121 Cingular Petition at 21.

UWB devices should not be authorized until testing definitively establishes that the deployment of these devices will not interfere with cellular and PCS operations. Cellular and PCS phones are used as emergency communications to place critical E911 calls. The Commission recognized the importance of these calls when it required most CMRS carriers to implement technologies capable of locating wireless E911 callers within specific degrees of precision.[122] The Commission must reconcile its approach taken in the E911 docket – stressing the importance of E911 accuracy and reliability – with the approach taken here which could impair the accuracy and reliability of E911 service. The Commission has imposed strict liability on CMRS carriers with respect to its E911 rules, but has now authorized devices that could jeopardize the ability of CMRS licensees to comply with the E911 rules.

C. The *MO&O* Contains Contradictory Statements Regarding the Record

The Commission supplies two contradictory rationales for dismissing the petitions for reconsideration filed by representatives of the CMRS industry. Cingular urged the Commission to reconsider the *First Report* because the Commission failed to consider the impact of UWB devices on cellular, TDMA, and GSM systems. The Commission rejected reconsideration on this ground because no data was provided regarding these services.[123] Later in the same order, however, the Commission refused to reconsider its decision until additional testing could be completed because "there have been considerable analyses throughout this proceeding on *every possible aspect of interference* under the worst receive conditions imaginable."[124] No record support is supplied for this statement. Moreover, if no data was provided regarding UWB-

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122 *See Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, *Report and Order*, 11 F.C.C.R. 18676 (1996) ("*E911 Report*").

123 *MO&O*, 18 F.C.C.R. at 3894.

124 *Id.* at 3897.

cellular interference, the Commission could not have considered every possible aspect of interference. This contradiction constitutes unreasoned decisionmaking.[125]

III. THE MO&O FAILS TO ADEQUATELY PROTECT THE RIGHTS OF INCUMBENT CMRS LICENSEES

A. The FCC Undermines the Exclusivity Rights of CMRS Licensees By Mischaracterizing a Recent Court Opinion

The Commission has undermined the exclusivity rights granted CMRS licensees by mischaracterizing *AT&T Wireless Services, Inc. v. FCC,* 270 F.3d 959 (D.C. Cir. 2001) ("*AWS*"). The FCC stated that the opinion "*affirmed* the Commission's decision that even an exclusive licensee cannot object to secondary use of its spectrum as long as no harmful interference results."[126] There was, of course, no affirmance; there was a remand. The court never endorsed all secondary spectrum use in the absence of harmful interference, given that the premise of the case was that there would be no degradation of service. The court certainly did not endorse secondary users causing objectionable interference to licensed service. Finally, the "affirmance" was specifically subject to the harmful interference issue being resolved in the remand.[127]

B. Incumbent CMRS Licensees Must Be Included in the Coordination Process

Cingular urged the Commission to reconsider its decision to exclude CMRS licensees from the UWB coordination process.[128] It demonstrated that without a coordination process it would be "impossible for cellular and PCS operators to track interference to its source."[129]

The *MO&O* again fails to include cellular and PCS licensees in the coordination process because "there is no reason to believe that these products, operating in compliance with the rules,

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125 *State Farm,* 463 U.S. at 43 (requiring a rational connection between the facts and the choice made). There can be no rational connection when the factual determinations conflict.

126 *MO&O*, 18 F.C.C.R. at 3886 (emphasis added).

127 *See AT&T Wireless Services, Inc. v. FCC,* 270 F.3d 959, 964 (D.C. Cir. 2001).

128 Cingular Petition at 21-24.

129 Cingular Petition at 23.

will cause harmful interference to such services."[130] The record demonstrates substantial disagreement with this conclusion. Numerous tests and analyses demonstrated the interference potential of UWB devices. Moreover, the Commission has authorized UWB operations on a secondary basis, which means that UWB users must rectify any interference they cause. By excluding CMRS licensees from the coordination process, the Commission has effectively given UWB operators primary status because CMRS licensees will be unable to pinpoint the source of interference.

Consistent with its determination that an "overprotective" posture with respect to interference from UWB devices is warranted, coupled with the secondary status afforded UWB devices, the Commission should reconsider the exclusion of CMRS licensees from the coordination process.

C. The Indoor Emission Limit For UWB Devices Should Be Lower

The Commission's determination that UWB devices should be permitted to produce higher emissions in indoor environments is fatally flawed.[131] This determination is premised on the attenuation provided by a building effectively reducing the emissions of a UWB device to points outside the building.[132] Although buildings provide attenuation of UWB signals being received outside, this completely disregards the fact that UWB devices may interfere with PCS and cellular handsets within the same building. It is indisputable that CMRS devices are more susceptible to interference indoors because of the signal attenuation caused by the building.[133] Therefore, CMRS devices need additional protection from UWB devices within the same building.

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130 *MO&O*, 18 F.C.C.R. at 3896.

131 *First Report*, 17 F.C.C.R. at 7460, 7467-69, 7486, 7500, & n.280.

132 *See id.*

133 The FCC never addresses the interference levels indoors. When a CMRS handset is located indoors, the received signal level can easily be 10-20 dB lower than when operating outdoors.

Cingular urged the Commission to reconsider its decision to permit higher UWB emissions indoors. It noted that the Commission previously recognized the difficulties associated with providing reliable cellular and PCS service within buildings, yet has now adopted rules that would create additional harmful interference.[134] In response, the Commission never explains why its decision does not undermine the interference protection guaranteed CMRS licensees.[135] The Commission's failure to explain why it authorized greater UWB emissions – rather than lower emissions – in an indoor environment constitutes reversible error.

CONCLUSION

The Commission should reconsider its decision to permit the unlicensed operation of UWB devices pursuant to Part 15 because it lacks statutory authority to do so and lacks concrete evidence that cellular and PCS licensees would be protected from interference associated with the deployment of UWB devices. Absent reconsideration, the *MO&O* also would undermine the public interest by jeopardizing the viability of E911 services. Finally, reconsideration is necessary to ensure that CMRS licensees are adequately protected and UWB operations are treated like a secondary service.

Respectfully submitted,

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134 *See E911 Report*, 11 F.C.C.R. at 18712.

135 *MO&O*, 18 F.C.C.R. at 3896.